

irradiation. (e) When evidences of acidosis exist at the time of irradiation they may diminish or disappear with the improvement in the sugar tolerance. (f) The effect of irradiation on the pancreas is due to direct stimulation of cellular metabolic processes and not due solely to alterations primarily vascular. (g) This stimulation is merely an example of the Arndt-Schulz observation that cell irritants in small doses stimulate metabolic processes. (h) When the irradiation is used in too large a dose, injury to the pancreatic function is apparent in a diminution in carbohydrate tolerance. (i) When tissues other than those containing the pancreatic rest are irradiated no effect is observed on the carbohydrate tolerance other than the primary augmentation of sugar excretion. (j) The titer of the serum diastases, which may be altered by irradiation of the liver, seems to be without influence on the tolerance.

Blood sugar determinations were carried out by Dr. Kraft, to whom we are under obligations.

### INFECTIOUS ARTHRITIS OF THE SPINE\*

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ARTHRITIS of the lumbar spine traceable to infections is a common cause of low back pain. The cases herein described are characterized mostly by their mildness, by their ability to walk, by the involvement of the vertebræ and the perivertebral tissues, by the presence of lateral deviation of the spine and by the absence of sharp, angular kyphoses. Two of the patients have been previously treated for sciatica by means of massage and electricity; epidural injections have been done without success. They all complained of pain in the sacro-iliac region, and with striking frequency, they were labeled sacro-iliac slipping. The course was self-limited and several months was the average time lost from disability.

It is intended to omit any reference to gonorrheal, syphilitic or tabetic spines, as well as those of infancy and childhood. All Wassermann tests were negative.

In P. W. Nathan's paper on "Polyarthritis and Spondylitis," published in 1916, after an account of a series of experimental streptococcemias in dogs, he states: "It therefore becomes necessary to classify the spondylitides according to the presence or absence of neural symptoms, the mode of progression or the involve-

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ment of the ribs and joints of the extremities. Whether these structures are involved or not is simply an accident of localization and does not depend upon peculiarities or essential differences in the etiology or the pathogenesis of the morbid process. It is, then, no longer necessary to specify by name the type of the spondylitis (Bechterew, Strümpell, Pierre Marie, etc.); these conditions are not essentially different; they are all simple variations in the location of some inflammatory condition which, like all inflammatory conditions, may be acute or chronic, transient or progressive, with or without permanent damage to the tissues involved."

Traumatic surgery of the spine was an attractive field during the World War, and many articles have appeared in the literature of the spine and spinal cord. On the non-surgical affections of the spine that are so common in civil life there has evidently been less material to stimulate description. While on duty in army hospitals I saw many instances of infectious arthritis and peri-arthritis, but none affecting the spine. Traumatic and tuberculous cases seemed to form the greater part.

Lance and Jaubert, in the *Revue de chirurgie*, August, 1919, mention the frequency with which spondylitis and perispondylitis were encountered among French soldiers. Their service was in the hospitals in the Maritime Alps, to which patients were sent for heliotherapy, with the diagnosis of Pott's disease or the infectious arthritides of the spine complicating pulmonary tuberculosis. They describe eighteen cases, dividing themselves into two groups: (a) Four cases of spondylitis of infectious origin, definitely determined (that is, staphylococci, streptococci, Eberth's and paratyphoid bacilli), were found; (b) fourteen cases of perivertebral lesions in which the etiology is debatable and in which purely bone lesions do not appear except in a few instances. This group embraces many polyarticular cases with stiff spines, mostly with bow-backs—the von Bechterew type.

Case 1 was an army colonel, aged fifty-three years, whose thigh had been amputated two months before for staphylococcus infection; he later suffered from an ischiorectal abscess, also staphylococcal, following which he developed a painful gibbus. Roentgen ray disclosed destruction of the bodies of the eighth and ninth dorsal vertebrae, disappearance of the intervertebral disk, and fusion of the two bodies.

Case 2 of their series was a colonial soldier, aged twenty-eight years, in hospital for otitis purulenta, bronchitis, ophthalmia and abscess of the knee. Streptococci were recovered. Three weeks later he had symptoms of Pott's disease; he suffered from extreme sensitiveness and excruciating lumbar pain for five months. Roentgen ray then demonstrated diminution in height of the fourth and fifth lumbar, effacing of the intervertebral space and squashing of the right half of the body of the fourth lumbar. On the right

border of the two affected vertebrae are noted new periosteal formations (deposits) well marked, especially around the transverse processes, which were treated by means of the plaster corset.

Case 3, a soldier, aged thirty years, old otitis media purulenta, had typhoid fever in September, 1916; defervescing on October 20, when he developed a backache, rigidity of the back and paresis of the lower extremities. Coincident recurrence of the otitis. Lumbar puncture yielded clear fluid and gave momentary relief. In December, roentgen-ray showed a collapse of the second and third lumbar vertebrae, one upon the other. Plaster jacket applied. In February, rigidity of the entire column was noted, with pain on attempted movement. By October, 1917, the first lumbar intervertebral disk was half destroyed and the second and third bodies completely fused. There was some destruction of the second disk. The two vertebrae have the characteristic form of the toy "diabolo" (i. e., reel-shaped or spool-shaped) of perispondylitis. The fifth lumbar appears collapsed and shortened, with the disk one-half destroyed and the other half ossified.

Case 4 was a farmer. After paratyphoid a positive blood culture was made February 3, 1915. In April, there was severe, sudden sacrolumbar pain, with fever. He was disabled for two months. A lateral lumbar deviation was noticed. In January, 1916, there was a small gibbus and total lumbar deviation. In March, the radiograph revealed collapsed and fused fourth lumbar, especially on the right half of each; the intervertebral disk between them has disappeared and a large mass of perivertebral ossification is seen at this level at the right and around the base of the spinous process. Two excrescences from ligamentous ossification were noted. He was discharged in May, 1916, decidedly improved.

The region of the back between the tenth dorsal level and the trochanters furnishes as much food for clinical study as the romantic area of the right upper quadrant of the abdomen. Heavy muscles cover the spine, rendering it difficult to palpate. These same muscles cause profound changes in symmetry of the entire trunk when their function is directly or indirectly impaired. The bony structures are complex in their arrangement and in close proximity to important nerve trunks, whose irritation, in the presence of joint disease, may have far-reaching effects. As a result of the obscurity of some of these lesions we behold queer diagnoses and questionable healing cults.

Pancoast<sup>1</sup> says: "Lumbar spines are easiest to view in antero-posterior plates. The bodies are so large in comparison with the other portions of these vertebrae, the shadows of which are less confusing than in the cervical and dorsal spine. The intervertebral spaces are wide, and with the transparent disks permit a fairly

<sup>1</sup> Frazier's Surgery of the Spine.

clear view of the laminae, which project downward between the bodies. Likewise the intervertebral joints are frequently on a level with the disks, and as the articular surfaces are nearly in an antero-posterior plane the entire joint line is usually visible. These joints can be more adequately studied in this region than elsewhere, and slight displacement and the lesions of chronic arthritis can frequently be detected."

Any lumbar deviation in a patient who suffered from pain along the course of his sciatic nerve has been called sciatic scoliosis. Homologous and heterologous are adjectives, referring to whether the patient turns from or toward the painful extremity. The muscles concerned in the distorting process are supposed to be the flexors of the hip and the lumbar muscles, especially the powerful quadrati. What interests us here is the presence of bone or joint affections in the spinal column in a large number of adults who have the same deformity and the same symptoms. Cases of low-back pain, in which a lateral centering of the spine occurs and in which careful radiography demonstrates lesions here described, should not be classed under the caption of the idiopathic scolioses of adults.

A definite list is due to osseous thickening and muscular spasm when we exclude evanescent cases of lumbago. It can be directly translated in terms of inflammatory exudates, adhesions, absorption of cartilages, destruction of bony tissue, deposits, excrescences and ankylosis. The process in acute severe cases is one of rapid softening of a vertebral lip, contraction or shortening of a meniscus, soon eventuating in a rounded lumbar kyphosis. Softening and destruction of one-half of the upper margin of the last lumbar will most readily produce lateral deviation of the trunk. These changes may occur before they are recognizable in a roentgen-ray plate. A kyphoscoliosis coming on in the short space of a few weeks appears to be much more of a complicated mechanical process. It can be explained by a massive softening, destruction involving the lateral articulating processes, following by a partial sliding of an entire vertebral body to one side. The usual phenomena of arthritis ankylosa follow and the organization of ligaments results in calcified bands of spondylitis deformans.

A distinct limp from psoas irritation disappeared in all the cases under observation for a sufficient length of time. A persisting contraction usually means a polyarthritis with hip involvement, which has been omitted in this communication.

The deformity has diminished under treatment, as is the rule in mild cases of spinal osteo-arthritis. The alignment returns unless the vertebrae have assumed a rotary lateral deformity, as in one of my cases. A small degree of bony adhesion, say between two or three vertebrae, is easily compensated for in other sectors of the spine, so motion can be practically free and stature return

to the vertical. Recovery takes place with but little impairment of function. Ankylosis of bodies, the ideal process of resolution in inflammatory spinal disease, is "a consummation more devoutly to be wished" than an orthopedic operation designed to splint the spinous processes.

**Infectious Arthritis of the Spine in Adolescents.** How many of our "star" cases of a decade ago who recovered from hip disease with perfect function have proved, in these days of the roentgen ray, to have been more or less typical instances of Perthes's disease? We encounter occasionally adolescents with backache, with a slight projection of one or more vertebral spines, giving a history of mild onset and more or less tranquil course. When they occur in subjects who are large and vigorous the abnormal projection is more noticeable. I have seen two girls of fifteen years, one of them almost six feet tall, whom I treated for lumbar spinal disease; they both recovered in a year, but neither pain nor muscular spasm nor recurrence of symptoms have appeared for eight years. An insignificant kyphosis and a slightly restricted range of side bending are the only sequelae of these two lesions. Will a further study of these cases by the roentgen-ray indicate a mild or "quiet" spinal disease, an infectious osteochondritis juvenilis? It will be remembered that in the ossification of each vertebra a thin, flat, circular epiphyseal plate of bone is formed in the layer of cartilage on the upper and under surfaces of the body. The age at which this occurs is twenty-one years and the upper plate is thicker than the lower; all ossific centers become joined and the bone is completely ossified between the twenty-fifth and the thirtieth year of life. The probability occurs that we may be able to demonstrate lesions in this circular plate analogous to the trophopathies of osteochondritis.

**Treatment.** The treatment of infectious arthritis of the spine is essentially mechanical. A plaster jacket and rest in bed are necessary to control symptoms during the acutely painful stage. To prevent deformity in certain cases a Bradford frame may be used. Without immobilization there is always a possibility of extension of the process. Braces are indicated for a more or less prolonged period to control recurrences. A few of my patients are more comfortable in jackets applied while reclining on a sacral support. This can be explained by an induction of the normal lumbar curve with a coincident separation of the anterior lips of the inflamed vertebrae. One objection to the jacket spica in women seems to be the present shortage of household servants. This difficulty may be met by periods of rest in bed, alternating with short periods of immobilization in light spicas. Full-length jackets extending to the trochanters or including a few inches of thigh on the painful side are most comforting.

The portals of entry of these infectious arthritides of the spine

have painstakingly been looked after. Two years ago all our cases were subjected to rigid scrutiny so fashionable at the time. No single case of mine of infectious arthritis of the spine has been cured by the extraction of teeth or the removal of bridges. Nothing herein should be construed, however, that my patients suffering from backache have not been relieved by oral and throat hygiene by removal of the pelvic or osteomyelitic foci, etc.

The metastatic spinal infections, such as typhoid, uterine infections, some staphylococcemias, etc., are essential sequelæ of saturation of the blood, with virulent bacteria in great numbers. The course, being limited by this period of virulence, is usually of short duration; therefore an operation to fix any portion of such a spine is not indicated.

Light braces of various types, or the Knight spinal brace, have been used during convalescence. The question of massage is to be decided by signs and symptoms. In the acute stages it is contraindicated; in convalescence it occasionally gives relief. The best authorities are not in favor of it. Most of my patients are comfortable without local stimulation by friction, but the cautery, hot baths, heat—in fact, in any form that requires no movement of the spine—is the source of much satisfaction. Violent twistings, pushings, kneadings and so-called adjustments are manifestly harmful; they are followed by tearing of adhesions and loosening of benign excrescences from the edges of vertebral bodies. For the same reasons spa treatments, so popular in Europe, are also contraindicated. The French authors speak very highly of heliotherapy.

CASE I.—*Staphylococcus Ostitis of the dorso-lumbar Spine.* A Russian woman, aged thirty-eight years, was seen in February, 1916. She had been delivered, with the aid of instruments, five months before. The puerperal discharges two weeks later became hemorrhagic and there was dangerous exsanguination. She was removed to the hospital and remained there for seven weeks. The diagnosis was blood-poison; her temperature rose frequently to 105°, and there were chills. On the twenty-first day she was seized with severe pains in the back, later in the thigh and leg. Temperature subsided gradually. Pain has kept her in bed ever since her discharge from the hospital. Many times a day she complains of severe attacks of grinding in the right sacro-iliac region, the right thigh and leg. Great difficulty was experienced in turning the patient in bed for spinal examination. A rounded kyphosis at the twelfth dorsal and first lumbar vertebræ, with extreme tenderness to either side, over the lateral masses, was easily made out. There was considerable muscular spasm, but no thickening nor abscess. The patellar clonus that was elicited on both sides was most marked on the right. The knee-jerks were

exaggerated, as was the Achilles jerk on both sides. Ankle-clonus was present. Temperature and pulse were normal. A brace was fitted to support the weakened spine and the patient was very definitely improved in a week. Diminished cramps in the legs and almost no backache.

CASE II.—*Arthritis of the Lumbar Spine; Lateral Deviation.* A man, aged thirty-eight years, sent by the neurological service (Mount Sinai) for pain localized over the sacro-iliac joint ("sacro-iliac case"). Local tenderness over the same region, but con-



FIG. 1. Case II.—Arthritis infectious lumbar spine.

siderable spasm of the spinal muscles; the roentgen ray detects the lesion to be in the third and fourth lumbar bodies, with lipping of the edges. Three years before he had been in bed for a week and unable to work for three months on account of a right sciatic neuritis; three perineural injections were then given. Patient remained well. Three months before coming under my observation the symptoms returned and were treated by means of a sacro-iliac belt. This did not prevent the gradual increase of a well-marked list of his spine to the left. The pain gradually increased also and was successfully controlled by means of a jacket applied with the aid of a hip rest, extending half-way to the knee.

CASE III.—*Infectious Arthritis of the Lumbar Spine; Lateral Deviation.* A department manager, aged forty-one years, a man of very nervous makeup, was seen for a severe sacral backache. He had had a slight low-back pain six years before. This illness commenced after a game of tennis four weeks previously. His pain radiated into the buttocks and into the lumbar region, and was agonizing on turning over in bed. Bowels, urine, blood and blood-pressure were normal. He had bilateral weak-foot and marked tenderness over the right sacro-iliac joint. He was kept in bed and his lower back was immobilized in plaster. Five weeks later the examination showed marked stiffness in the lower lumbar region and very definite muscular spasm. He had developed a distinct list to the left. The roentgen-ray then demonstrated that the last lumbar vertebra was decidedly sclerosed; its shadow increased in density and its lateral edges roughened and thickened. It was decided that he was suffering from an arthritis that had begun six years ago. A Knight brace was applied, not without some difficulty, on account of the list of the trunk to the left side. This lateral deformity decreased in a month, and in two months the patient was walking erect and able to do part of his work. There was little pain, the lumbar region was flat and very slight limitation of hyperextension of the hips, previously free. The cautery and continuous wearing of the brace resulted in his return to full duty at his desk in another month.

CASE IV.—*Osteo-arthritis of the Lumbar Spine; Sequel of an Acute Infectious Arthritis.* Postman, aged fifty-five years, complained of many attacks of lumbago lasting a few days. In 1914 he had an acute sciatica, for which a perineural injection was given by a surgeon. This gave no relief and a month later the pain became so severe that he took to bed. The pain was constant and darting in the left hip, the sacro-iliac region and down the course of the left sciatic nerve. I saw him in consultation in February, 1915, and found besides the usual tender sciatic points an absolute rigidity of the lumbo-sacral joint. There was a very marked degree of spasm of the lumbar muscles; hyperextension of the hip was painful and limited by muscular contraction. The other hip motions were perfectly free. A roentgen-ray plate showed that the last lumbar vertebra was atrophic and its upper edge had a moth-eaten appearance on the left half. A plaster spica was applied March 14, 1915, and his pain disappeared in a few days. He had required morphine and codeine for six weeks before that to control severe paroxysms. None has been administered since. He gained in weight rapidly. In June, 1915, a Knight spinal brace was applied. Spasm had disappeared; no pain. He walks sixteen miles a day. In October he presented a stiffness and a lumbar flattening of the normal lordotic curve as the only signs of his previous illness. Two



years later a slight recurrence of pain in the left buttock was controlled by two weeks' rest in bed.

CASE V.—Sam P., aged forty-one years. He denies venereal infection. Two years before coming under observation (in 1916) he was confined to bed for two months by a vicious attack of sciatica. He received four epidural injections and the trouble in the right thigh disappeared. His complaint at that time was of a tearing, burning pain in the right thigh and knee down to the back of the ankle. There was, he said, a good deal of backache,



FIG. 2.—Case V.

but he was certain that no deformity of his back existed. The present illness began five weeks ago with the same symptoms, with the exception of the pain in the leg. In the first week the patient (while under treatment in another hospital) noticed that he became gradually crooked and that his body seemed to point to the left. Liniments and internal medication left him unimproved and he applied for treatment at the orthopedic department of the Mount Sinai Dispensary. He presented a marked lumbar deviation to the left, the spine seeming to center to that side; it was decidedly flat where the normal hollow should be. In every direction that motion was attempted the lumbar muscles stood out sharply in contraction.

There was no temperature. His chief complaint was inability to walk without pain. Roentgen-ray findings: Marked rotation of the lumbar vertebrae, especially the second, the spinous process of which is turned to the left. The last three lumbar vertebrae show lipping of their articular margins. A plaster-of-Paris jacket with a small circle around the thigh afforded great relief at once (January 3, 1918). He reported once a week until February 28, when the jacket was changed for a shorter one. He still presented a well-marked torsion to the left. There was definite resistance to right side bending. Flexion and extension were comparatively free. The lumbar spines were rotated so that the left lateral masses were a little easier to palpate than the right. No kyphosis could be detected, but the spinous processes seemed unusually close to one another. No pain; very little tenderness except on vigorous percussion. We have reason to believe that this patient remained well.



FIG. 3.—Case VI.

CASE VI.—Joe E., a cabinetmaker, aged thirty-five years. Venereal infection denied. Eleven months ago he expectorated a little blood; the sputum and pulmonary examination were negative. Nine months ago he had an attack of lumbago, annoying but not disabling, for three days. Four months ago he had a sudden onset of severe pain in the right buttock, right groin, soon

extending throughout the course of the right sciatic nerve and the lumbar region. He was treated for sciatica, and massage and electricity were given, likewise a generous amount of medicine and many baths. After ten weeks of suffering he applied for treatment at the Mount Sinai Dispensary; he then complained of pain in the right gluteal region and in the sacrum. A well-marked list to the spine was noticeable, muscular spasm was decided and clinically he presented the signs of a lumbar spondylarthritis. A short time after applying a jacket with a thigh ring all symptoms were completely relieved. Five weeks later the jacket was removed temporarily for the purpose of taking a roentgenogram and his trouble returned in a mild form. The spine straightened appreciably. Another jacket was applied, with complete relief. The patient had lost seven pounds, presented a flattening of the lumbar curve, and a left dorsal and a right lumbar deviation. There was marked spasm of the lumbar spinal musculature. The motions of the lumbar sector of the spine were *nil* and the first of these vertebrae were very tender over their spinous processes. Knee-jerks were lively; no ankle-clonus; no Babinsky; no evidence of psoas irritation. Diagnosis: Lumbo-sacral arthritis with spinal deviation. Roentgen-ray findings: A slight flattening out as well as a slight lippling of the surfaces of the bodies of the last two vertebrae. He has never been sick since and has worked steadily (April, 1921).

## OBSTRUCTION OF THE SUPERIOR VENA CAVA BY PRIMARY CARCINOMA OF THE LUNG.

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### PATHOLOGICAL REPORT

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IN the years since a case of obstruction of the superior cava was first reported by Corvisart, in 1806, there have been recorded 300 cases of this condition, although many of the reports do not permit of a definite conclusion as to the primary etiology.

First collected by Oulmont<sup>1</sup> in 1856, Fischer<sup>2</sup> in 1901 tabulated 253 cases, to which list Hume added 12 cases from the literature, in Osler's<sup>3</sup> report of 2 cases of his own in 1903. The remaining 17

<sup>1</sup> Soc. m d. d'observation, 1856, t. 3, 463.

<sup>2</sup> Inaug. Dissertation, Halle, n. S., 1904.

<sup>3</sup> Bull. Johns Hopkins Hosp., 1903, 14, 169.